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RECENT OUTBREAKS of African Swine Fever (ASF) in Vietnam, Cambodia, Laos, South Korea, and especially China, have generated interest in how world commodity markets will adjust in response to pig herd losses due to the disease and to panic culling to avoid the negative impacts of the disease. This adjustment is complicated by the retaliatory duties of 25% and 60% that China has placed on US soybean and pork exports, respectively, and the duration of temporary exemptions on these tariffs on soybeans and pork. It is clear that a scarcity of pork will cause a reduction in pork consumption in impacted countries and a switch to alternative proteins. It is also clear that countries (such as the European Union and Brazil) who have direct access to China's pork and chicken markets will see an increase in exports. What is less clear is the second-round impact of these adjustments. Will the United States ship more pork to markets vacated by the European Union and Brazil as these countries pursue lucrative markets in China? What is the net impact on US and world soybean and corn exports and prices? What would be the implications for the United States if China removes retaliatory duties?

In mid-October 2019, the Chinese Ministry of Agriculture and Rural Affairs reported the September 2019 hog inventory is down by 41.4% compared to a year prior, and the size of the breeding herd declined by 38.9% from September 2018 to September 2019. This represents a loss of about 10 million sows over a year, which is larger than the entire US inventory of 6.3 million head (USDA-FAS 2019). In addition, ASF outbreaks have appeared in all Chinese provinces with the most recent outbreak in October (see the ASF map at https://www.card.iastate.edu/ag_policy_review/f18-asf/), and thus the inventory decline is viewed by some as an underestimate of the true scale of the loss (Pig Progress 2019).

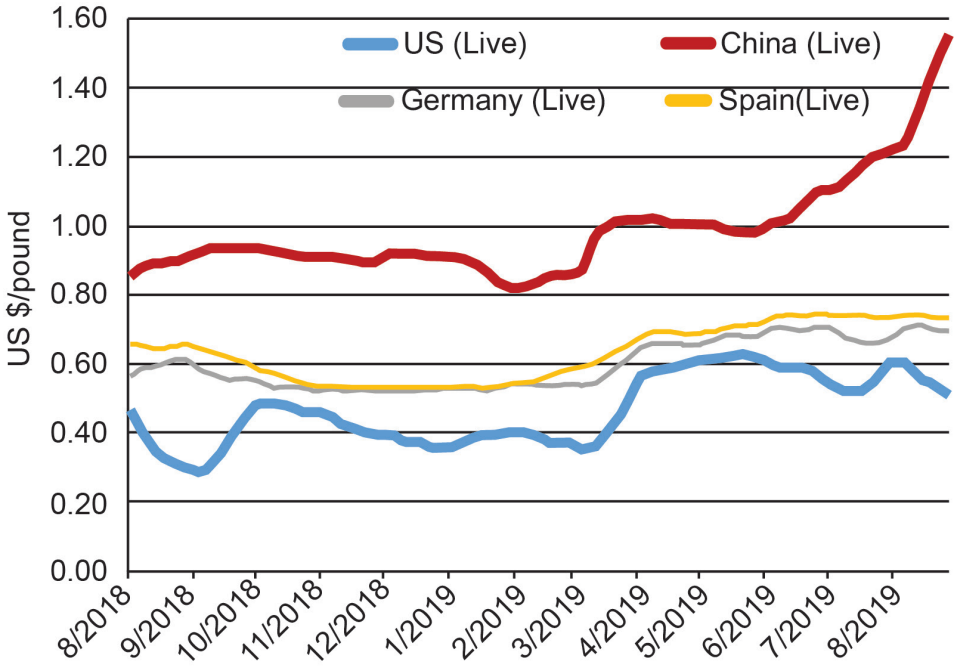

Figure 1. Live hog prices weekly, August 2018–August 2019.

Figure 1 shows the impact of reduced production on Chinese live hog prices. The most recent weekly data from October 9 shows that Chinese live hog prices at $1.93/lb (¥30/kg) are now three times the US level ($0.68), and have jumped over 100% over the past year.

The CARD-FAPRI Model – Assumptions and Scenarios

The CARD-FAPRI modelling system is well suited to evaluate some of these first- and second-round impacts. The system is a partial equilibrium model that contains supply and demand equations for all of the important temperate commodities in every important producing or consuming country (Tokgoz et al. 2007). This commodity/country-wide coverage is important because it allows for adjustments in production and consumption in places like Brazil and the European Union. Although the scale of losses in Asia is massive, it is modest when compared to worldwide protein production. The CARD-FAPRI model allows for these worldwide protein adjustments.

We examine two scenarios. In both we assume that China, Vietnam, South Korea, and the "Rest of Asia" region incur a 30% permanent reduction in their sow herd. The "Rest of Asia" is a catchall for smaller countries such as Laos and Cambodia that we do not model explicitly. As of yet, there are no impacts on pork production in Thailand, Taiwan, Indonesia, and Japan.

One scenario ("Duty and ASF") assumes that the retaliatory duties on US pork and soybeans remain in

place. The second scenario ("Only ASF") assumes removal of these duties. Recent progress in US-China trade talks have led China to exempt duties on US pork and soybean exports, in part to alleviate ASF. In the "Duty and ASF" scenario, US soybean and pork prices fall below the prices in other exporting countries. In the "Only ASF" scenario, the US price is also the world price.

Note that if one believes that the 30% reduction is reasonable then the difference between the "Only ASF" and "Duty and ASF" becomes an estimate of the damage caused by the retaliatory duties. This is true, because in this case the "Only ASF" scenario becomes the baseline.

It is very possible that a vaccine will be developed or that some countries will find a way to eliminate the disease in the next ten years. If this happens, then the "Only ASF" scenario will revert to baseline levels.

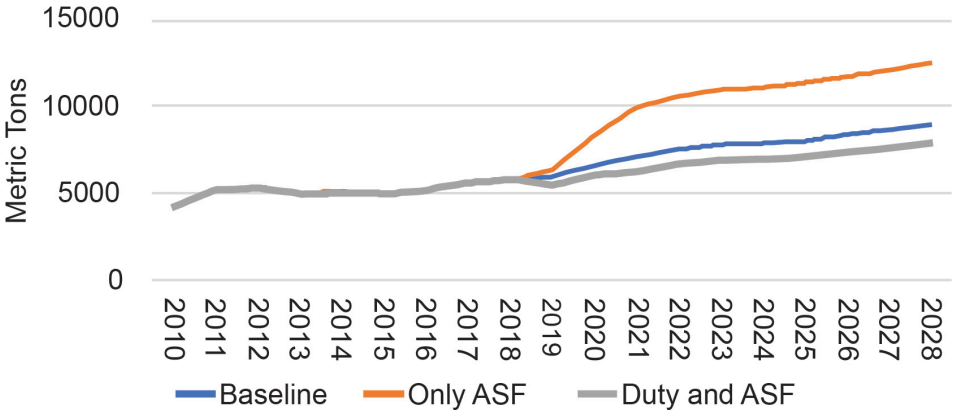

Figure 2. US pork exports (Metric tons).

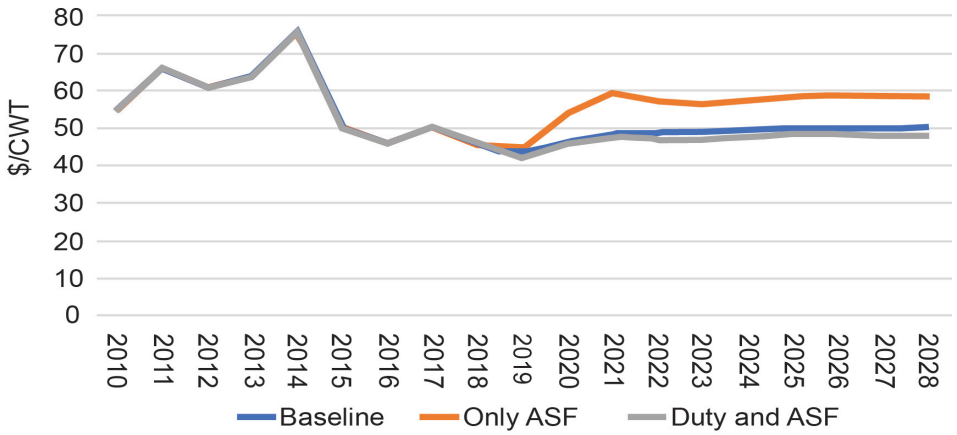

Figure 3. US pork price ($/CWT).

Results

Figure 2 shows that the disease presents significant growth opportunities for US pork exports: specifically, a persistent 30% decline in Asian hog inventory boosts US pork exports by 3.4 million metric tons, which would translate into over $7 billion. This is also consistent with our previous estimate of a possible $8.9 billion export growth for US pork once China removes non-tariff barriers (Li, Zhang, and Hayes 2018). However, tariffs would more than wipe out (or possibly reverse) the possible growth in US pork exports if the trade tensions persist.

Figure 3 shows that the elevated export demand due to ASF will also push US pork prices from $50/cwt to close to $60/cwt, a potential gain at risk of not being realized due to the trade tension.

One would expect that the reduction in hog and sow inventory would also lead to slightly weaker demand for feed grains. However, the model output for corn (not shown here) shows almost no impact. This corn price response is muted because worldwide consumption of other proteins increases and these birds and animals need to be fed.

Figures 4 and 5 show US exports of soybean meal and soybeans. The 25% retaliatory tariffs resulted in significant reduction in US soybean exports (as more beans are crushed domestically in response to higher local margins), but the United States increases exports of soybean meal to Argentina and countries formerly served by Argentina while China buys more soybean meal from Argentina. ASF leads to reduced feed grain demand and results in lower exports of soybeans and soybean meals.

The impact of ASF on US whole soybean (figure 5) and corn exports (not shown) is extremely small. This is true because worldwide production of other proteins increases to fill the gap in Chinese pork production.

Conclusion

ASF is a black swan event in the global agricultural markets. So far, it has affected multiple countries in Eastern Europe and Asia and resulted in a loss of nearly 40% of the hog inventory of China—the largest pork producer in the world with half the pigs globally. Our CARD-FAPRI model shows that ASF would significantly boost US and global meat exports and impact crop and livestock prices. Of course, this relies on the successful prevention of outbreaks of ASF in the United States or other major pork production regions such as Western Europe.

continued on page 13